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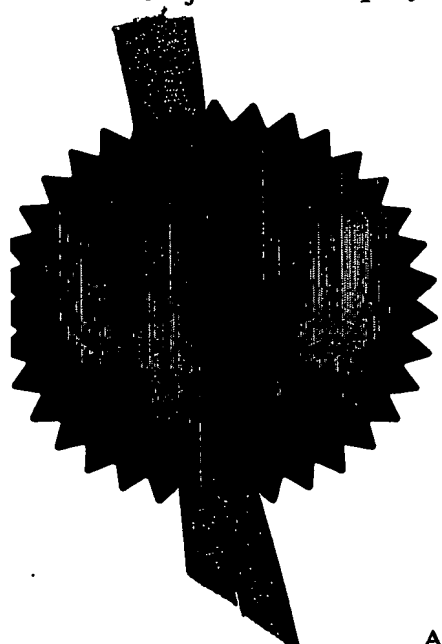
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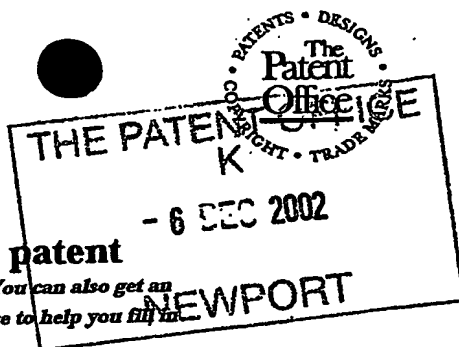


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*Stephen Handley*

Dated

5 January 2004



0608 0769103-4 002811  
P01/7700 0.00-0228478.4

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# Request for grant of a patent

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1. Your reference

A10740GB-GMD

2. Patent application number

(The Patent Office will fill in this part)

0228478.4

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Techtronic Industries Company Limited  
24/F CDW Building  
388 Castle Peak Road  
Tsuen Wan, N.T.  
Hong Kong

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

Hong Kong

6548911 002

4. Title of the invention

Head for a Suction Cleaner

5. Name of your agent (if you have one)

Forrester Ketley & Co.

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Chamberlain House  
Paradise Place  
Birmingham  
B3 3HP

Patents ADP number (if you know it)

133005

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
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Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if

a) any applicant named in part 3 is not an inventor, or

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Description

10

Claim(s)

4

Abstract

1

Drawing(s)

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Statement of inventorship and right to grant of a patent (Patents Form 7/77)

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I/We request the grant of a patent on the basis of this application.

Signature

Forrester Ketley & Co.

Date

5 December 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Graham M. Dodd  
0121 236 0484

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**DUPLICATE**

PATENTS ACT 1977

A10740GB-GMD

Title: Head for a Suction Cleaner

5 Description of Invention

The invention relates to a head for a suction cleaner, and in particular to a head including a rotatably driven brush either of the kind adapted for attachment to a wand of a "cylinder" type suction cleaner, or of the kind incorporated in an "upright" type suction cleaner.

10 Domestic suction cleaners, more commonly called vacuum cleaners, are generally divided into two kinds; "upright" cleaners in which the head is integral with or at least pivotably connected to the main body of the cleaner, and "cylinder" cleaners in which a hose and/or wand connects any tools such as the head to the main body of the cleaner. In the former kind of cleaner the head  
15 usually includes a driven brush bar. In the latter kind all tools originally incorporated fixed brushes, but more recently various head designs have been introduced incorporating rotatably driven brushes.

The means of driving such brushes vary. In general in upright cleaners the brush bar is driven by a belt powered by electric motor, this being either the  
20 main motor which provides the suction or a secondary motor provided specifically for that purpose. In cylinder cleaners, some use the suction of the main vacuum cleaner and a turbine in the head to drive the brush, whilst others include an electric motor in the head powered by an electrical supply provided down the hose/wand combination. In the latter case the drive to the brush in the  
25 head may be by means of a belt or direct.

The problem with driven brushes, in both upright and cylinder vacuum cleaners, is that they often get entangled with elongate items which have been vacuumed up, such as pieces of string or ribbon, or even long human hair. This can result in significantly degraded performance because of restricted airflow

around the brush and therefore it is important to remove such entangled items in order to obtain good performance from the vacuum cleaner. However, experience has shown that most users simply do not clear the brush bar as to do so in the prior art cleaners require the use of tools, generally to remove a sole plate of the head.

A problem which is common to all heads for suction cleaners, both with and without brush bars, is that of the airflow passages within the heads becoming fully or partially blocked by inappropriate debris which has been sucked up. Clearly in such circumstances the performance of the cleaner is severely degraded and can only be restored by clearance of the blockage. However, it has been found that with prior art suction cleaners users are very slow both to realise that a blockage has occurred and also to take the necessary action to clear it. The latter is largely because of the need to use tools to open the head of the suction cleaner and because the task, even with tools, tends to be quite difficult to perform requiring a high degree of dexterity, as it can include removing and reinserting screws.

It is an object of the present invention to provide an improved form of cleaning tool employing a rotatably driven brush which mitigates the above described problems.

According to a first aspect of the present invention there is provided a head for a suction cleaner, the head including:

- a lower housing portion; and
- an upper housing portion;

characterised in that

the upper housing portion is pivotable relative to the lower housing portion between a closed position for use and an open position in which airflow passages within the head are opened from above.

The head of the invention provides the advantage that it can readily be opened for simple clearing of the airflow passages and general maintenance purposes.

5 The head may further include a rotatably mounted brush bar mounted within the housing portions.

Preferably the lower housing portion does not include any part which extends laterally in front of the brush bar, such that when the upper housing portion is in the open position the brush bar is also exposed from the front.

10 Furthermore it is preferable that the head does not include a sole plate, or the like.

Conveniently, when the upper housing portion is in the closed position it defines, in combination with the lower housing portion, an airflow opening which in use is adjacent the ground and within which the brush bar is located if included in the head.

15 Preferably it further includes at least one catch to retain the upper housing portion in the closed position which is releasable without the use of any tool.

20 When the upper housing portion is in the open position it may be the case that airflow paths within the head are accessible for cleaning or maintenance.

It is preferred if, the brush bar is selectively driven by a drive mechanism and when the upper housing portion is in the open position, the drive mechanism is accessible for cleaning or maintenance. In such circumstances the brush bar is readily removable without the use of any tool.

25 The head may further include a switch for control of the drive mechanism which is open when the upper housing portion is in the open position, such that the drive mechanism cannot be operated, and closed when the upper housing portion is in the closed position, such that the drive mechanism can be operated. In such cases the switch may be activated by a

protrusion on an inner surface of the upper housing portion which contacts the switch when the upper housing portion is moved to the closed position.

The drive mechanism may include an electric motor within the head.

As an alternative to including an electric motor, the drive mechanism  
5 may include a turbine within the head. In this case, the accessible air flow paths within the head, when the upper housing portion is moved to its open position, may include a path to and/or from the turbine, or possibly even through the turbine providing access to a rotor thereof in case it should require to be cleaned.

10 According to a second aspect of the present invention there is provided a suction cleaner including a head according to the first aspect of the invention.

According to a third aspect of the invention there is provided a cleaning apparatus adapted for use with a suction cleaner, the cleaning apparatus including:

15 a connector adapted to be removably connected to a wand of the suction cleaner;

a lower housing portion secured to the connector and having ground engaging wheels;

an upper housing portion secured to the connector,  
20 characterised in that

the lower housing portion provides support for a rotatably mounted brush bar, and

the upper housing portion is pivotable relative to the lower housing portion between a closed position and an open position in which the brush bar  
25 is exposed from above.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is perspective view of an embodiment of a head for a suction cleaner according to the invention;

Figures 2a & 2b are side views of the head of Figure 1, connected to the wand of a suction cleaner, and in (a) a first position and (b) a second position;

Figure 3 is a rear perspective view of part of the head of Figure 1, showing the catch in more detail;

5 Figure 4 is a perspective view of the head of Figure 1 with the upper housing portion in its open position;

Figure 5 is a perspective view of the head of Figure 1 with the upper housing portion in its open position, and the brush bar in the process of being removed;

10 Figure 6 is an enlarged perspective view of part of the head of Figure 1 with the cover of the electric motor removed for clarity;

Figure 7 is an enlarged perspective view of the drive for the brush bar of an alternative embodiment, again with the cover of the electric motor and of the drive belt removed; and

15 Figure 8 is an enlarged perspective view of part of an alternative embodiment of head, including a turbine for driving the brush bar.

Referring to the Figures, a head 10 comprises a lower housing portion 12, an upper housing portion 14 and a connector portion 16 for connection of the head 10 to a wand 18 of a suction cleaner (not shown). The connector portion 16 is pivotally secured to the lower housing portion 12, as best  
20 illustrated in Figures 2 and 3; Figure 2 showing the general relationship between the components in normal use and Figure 3 showing the general relationship between the components in storage or when reaching under furniture for example. The ability to reach the flat position shown in Figure 2b  
25 is provided by the raised pivot axis A of the connector portion 16 relative to the lower housing portion 12 with respect to the ground.

The upper housing portion 14 is pivotable about an axis B between a closed position shown in Figures 1 and 2 and an open position as shown in Figures 4 to 6. The upper housing portion of 14 is retained in the closed



position by means of catches 22, located towards either side of the head 10. The catches 22 comprise a conventional form of over-centre mechanism, as shown in Figure 3. They operate as follows: lower link 22a is released by pulling upwards as indicated by arrow X, the catch 22 then pivots up and forwards as indicated by arrow Y to release. The reverse is undertaken to resecure the catches 22. Thus it can be seen that the catches 22 can be released, and resecured, without the use of any tool.

The lower housing portion 12 provides ground engaging wheels 20 to either side towards the rear thereof. It also provides pivotally mounted brush bar retaining cradles 24 to either side towards the front thereof, for support of a brush bar 26. The brush bar retaining cradles 24 are pivotable about an axis C located rearwardly and above the location of the brush bar 26 in use. The brush bar 26 has on either end a removable end cap 28. The purpose of the pivotable brush bar retaining cradles 24 and removable end caps 28 will become apparent in due course when the removability of the brush bar 26 is described.

The brush bar 26 is selectively drivable by means of a drive mechanism which will now be described. The lower housing portion 12 provides support for an electric motor 30 and associated control unit 32, and motor cover 34 (shown in removed in Figures 4 to 6). The motor 30 provides the drive for the brush bar 26 via a drive belt 36 which passes around the brush bar 26 at the location of drive belt wheel 38. The path of the drive belt 36 is enclosed within a cover comprising a first cover part 40 provided by the lower housing portion 12, and a second cover part 42 provided by the upper housing portion 14. The cover provided by first and second cover parts 40, 42 means that the drive belt 36 is completely enclosed in use and thus protected from dirt and damage.

The control unit 32 for the motor 30 includes a switch 44 which is activated by a protrusion 46 provided on an inner surface of the upper housing portion 14. As the upper housing portion 14 is moved from its open position to its closed position the protrusion 46 operates external button 48 of the switch

44. The switch 44 is provided as a safety feature to ensure that the motor 30 cannot be operated to drive the brush bar 26 whilst the upper housing portion 14 is in its open position. Thus, the motor 30 can only be operated to drive the brush bar 26 when the protrusion 46 has operated the button 48 to close switch 44.

The control unit 32 further includes indicator lights 50, in this embodiment three of them, on its upper surface which can be viewed through an opening in motor cover 34, and an opening 52 in the upper housing portion 14. The indicator lights 50 can, for example, be used to indicate that (a) a supply of electricity is provided to the control unit 32, (b) the motor 30 is being operated such that the brush bar 26 is rotating, and (c) that the brush bar is not rotating, i.e. has been fouled by some debris. Conveniently the lights for (a) and (b) may be green LEDs and the light for (c) may be a red LED. Clearly the number of indicator lights provided and what they indicate may be varied as desired, for example they may indicate whether the brush bar is rotating at full speed or at a lower speed.

When the upper housing portion 14 is in its closed position it, in combination with the lower housing portion 12, defines an airflow opening 54, in which the brush bar 26 is located. The airflow opening 54 communicates with airflow passages 56 within the head 10 and positioned to either side of the motor 30 and control unit 32, and defined partly by the lower housing portion 12 and partly by the upper housing portion 14. The airflow passages 56 combine to form a single airflow passage (not shown) where the upper and lower housing portions 12, 14 are secured to the connector portion 16. The use of two airflow passages 56 to connect the airflow opening 54 to the single airflow passage which passes up the wand 18 of the suction cleaner provides for more even suction across the width of the airflow opening 54.

The construction of the head 10 as described above provides the ability for simple removal of the brush bar 26 for, for example, cleaning or

5 maintenance of the head 10. To remove the brush bar 26 the following steps are taken. The catches 22 are released and the upper housing portion 14 is pivoted upwardly about the axis B, to the position shown in Figure 4. In that position of the brush bar 26 is accessible from above, below and the front as indicated by arrows D, E and F in Figure 4. This is particularly the case because the lower housing portion 12 does not include any part which extends laterally between its sides forward of the brush bar 26, and because the head 10 does not include any sole plate or the like.

10 The brush bar retaining cradles 24 are then gripped and pivoted upwardly and rearwardly about axis C as indicated by arrows G in Figure 5. Next the end caps 28 are gripped and pulled outwardly as indicated by arrows H in Figure 5, to remove them from the ends of the brush bar 26. The brush bar 26 can then be lifted upwards and out of the head 10 as indicated by arrow I in Figure 5, with the appropriate lateral movement to remove the brush bar 26 from the drive belt 36.

15 As will be understood the brush bar 26 can be removed from the head 10 very simply and without the use of any tool. Furthermore, the brush bar 26 can be replaced within the head 10 by simply reversing the steps described above, and again without the use of any tool. Thus, the brush bar 26 can be cleaned and the airflow passages 56 cleared. As a result users of the suction cleaner concerned are much more likely to undertake such simple cleaning and maintenance than would be the case with prior art heads.

25 Referring now in particular to Figure 7, an alternative embodiment of the head, and in particular the drive mechanism for the brush bar is illustrated, with parts common to the previously described embodiment being like referenced, and will now be discussed. The drive mechanism includes a motor pinion 35 and a brush bar drive pinion 38, but the drive belt 36 has been replaced by gears 60, 62 and 64. This embodiment still enables the brush bar 26 to be removed in

the same simple way as described above as it is still the case that no component passes around the brush bar 26.

Referring now to Figure 8, this shows part of a head in which instead of there being an electric motor for driving the brush bar there is a turbine. Only  
5 part of the lower housing portion 12 is shown, and this includes a part 62 which (together with a corresponding not illustrated part of housing portion 14) defines a chamber within which a turbine rotor 60 having blades 61 is rotatably supported. An air inlet to such chamber from the region of the brush bar 26 is indicated at 63, and an outlet (not shown) from the chamber leads to the  
10 connector portion 16 in the vicinity of where the airflow passages 56 join. Thus part of the suction airstream passes through the chamber, causing the rotor 60 to rotate. The rotor shaft carries a pinion 35 connected by a toothed drive belt 36 to a drive wheel 38 on the brush bar 26.

If as shown in Figure 8 the pivoting of the upper housing portion 14 to  
15 its open position relative to the lower housing portion 12 exposes the turbine rotor 60 within its chamber, and the passages for flow of air to and from the chamber, cleaning of the rotor and/or the removal of any debris from the vicinity thereof which might impede its operation is facilitated. However, such cleaning of a turbine is likely to be required much less frequently than is  
20 attention to the brush bar, and hence in an alternative arrangement of a turbine the turbine may operate within a chamber defined by a part or parts which remain in place when the upper housing portion is moved to the open position. The use of tools may be required to gain access to the interior of the turbine and/or the associated air flow passages.

25 The invention has only been described in use with a selectively driven brush bar, however, it is equally applicable to any other kind of head for such cleaners. For examples heads with a rotatable but not driven brush bar, and heads without a brush bar but including fixed lines of bristles or a rubber blade.

Although the invention has been described in connection with the head of a cylinder type suction cleaner which is secured for use to a wand of the cleaner, it is equally applicable to the heads of upright type suction cleaners.

5 In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any  
10 combination of such features, be utilised for realising the invention in diverse forms thereof.

## CLAIMS

1. A head for a suction cleaner, the head including:  
a lower housing portion; and  
5 an upper housing portion;  
characterised in that  
the upper housing portion is pivotable relative to the lower housing  
portion between a closed position for use and an open position in which airflow  
passages within the head are opened from above.
- 10 2. A head for a suction cleaner according to claim 1 characterised in that it  
further includes a rotatably mounted brush bar which is exposed from above  
when the upper housing portion is in the open position.
- 15 3. A head for a suction cleaner according to claim 2 characterised in that  
the lower housing portion does not include any part which extends laterally in  
front of the brush bar, such that when the upper housing portion is in the open  
position the brush bar is also exposed from the front.
- 20 4. A head for a suction cleaner according to claim 2 or 3 characterised in  
that it does not include a sole plate.
5. A head for a suction cleaner according to any one of the preceding  
claims characterised in that when the upper housing portion is in the closed  
25 position it defines, in combination with the lower housing portion, an airflow  
opening which in use is adjacent the ground.
6. A head for a suction cleaner according to claim 5 as dependent upon  
claim 2 characterised in that the brush bar is located within the airflow opening.

7. A head for a suction cleaner according to any one of the preceding claims characterised in that it further includes at least one catch to retain the upper housing portion in the closed position which is releasable without the use of any tool.
8. A head for a suction cleaner according to any one of the preceding claims characterised in that when the upper housing portion is in the open position airflow paths within the head are accessible for cleaning or maintenance.
9. A head for a suction cleaner according to any one of claims 2, and 3 to 8 as dependent upon claim 2, characterised in that the brush bar is driven by a drive mechanism and when the upper housing portion is in the open position the drive mechanism is accessible for cleaning or maintenance.
10. A head for a suction cleaner according to claim 9 characterised in that the brush bar is readily removable without the use of any tool.
11. A head for a suction cleaner according to either one of claims 9 or 10 characterised in that it further includes a switch for control of the drive mechanism which is open when the upper housing portion is in the open position, such that the drive mechanism cannot be operated, and closed when the upper housing portion is in the closed position, such that the drive mechanism can be operated.
12. A head for a suction cleaner according to claim 11 characterised in that the switch is activated by a protrusion on an inner surface of the upper housing

portion which contacts the switch when the upper housing portion is moved to the closed position.

13. A head for a suction cleaner according to any one of claims 9 to 12 characterised in that the drive mechanism includes an electric motor within the head.

14. A head for a suction cleaner according to any one of claims 9 to 12 characterised in that the drive mechanism includes a turbine within the head and wherein said airflow paths include a path to and/or from and/or through the turbine.

15. A head for a suction cleaner substantially as hereinbefore described with reference to the accompanying drawings.

16. A suction cleaner including a head according to any one of the preceding claims.

17. A cleaning apparatus adapted for use with a suction cleaner, the cleaning apparatus including:

a connector adapted to be removably connected to a wand of the suction cleaner;

a lower housing portion secured to the connector and having ground engaging wheels;

an upper housing portion secured to the connector, characterised in that

the lower housing portion provides support for a rotatably mounted brush bar, and



the upper housing portion is pivotable relative to the lower housing portion between a closed position and an open position in which the brush bar is exposed from above.

- 5 18. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.

## ABSTRACT

Title: Head for a Suction Cleaner

5        A head (10) for a suction cleaner is described. The head (10) including: a lower housing portion (12); an upper housing portion (14); and a rotatably mounted brush bar (26) mounted within the housing portions (12,14). The upper housing portion (14) is pivotable relative to the lower housing portion (12) between a closed position for use and an open position in which the brush  
10    bar (26) is exposed from above.

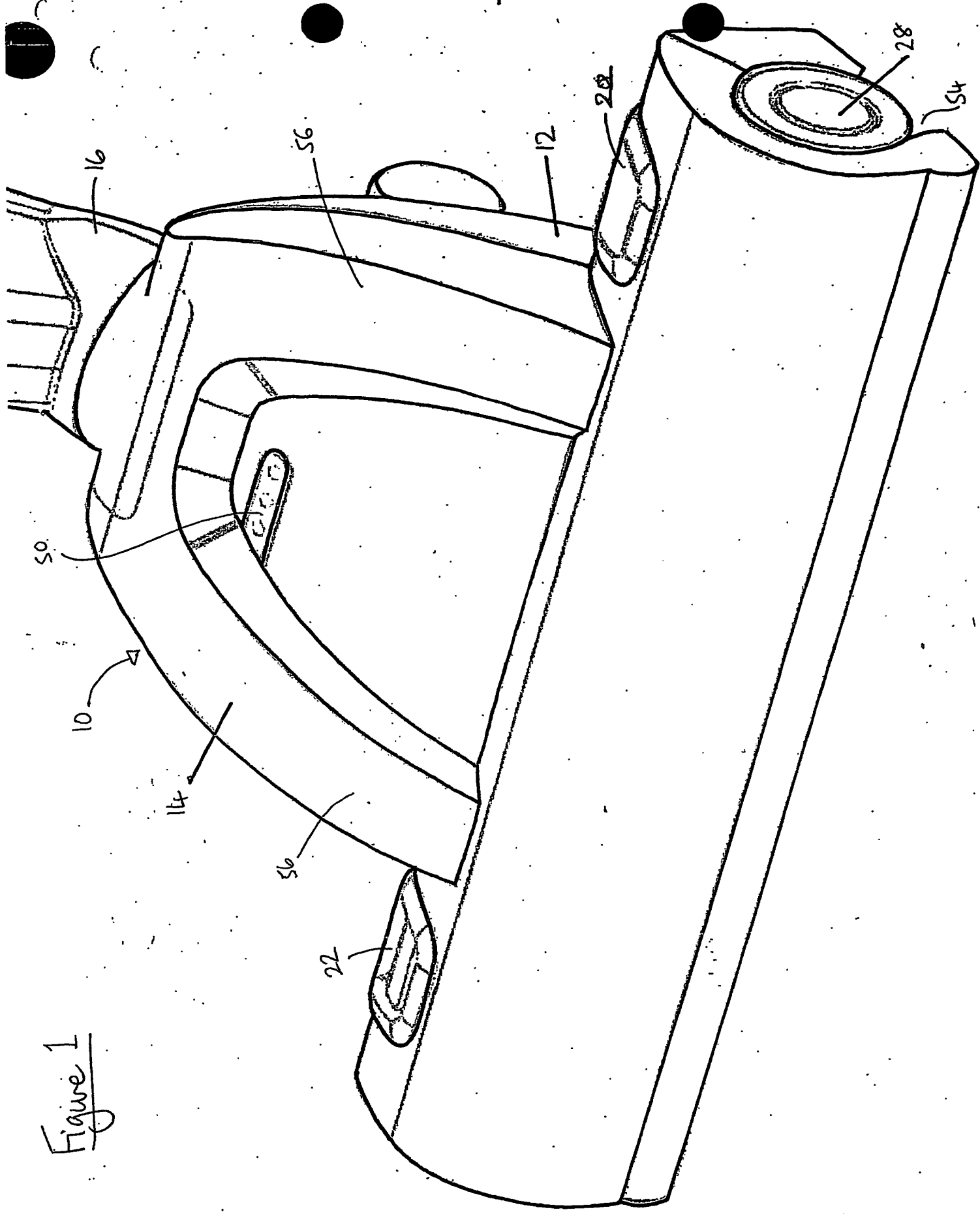


Figure 1

Figure 2a

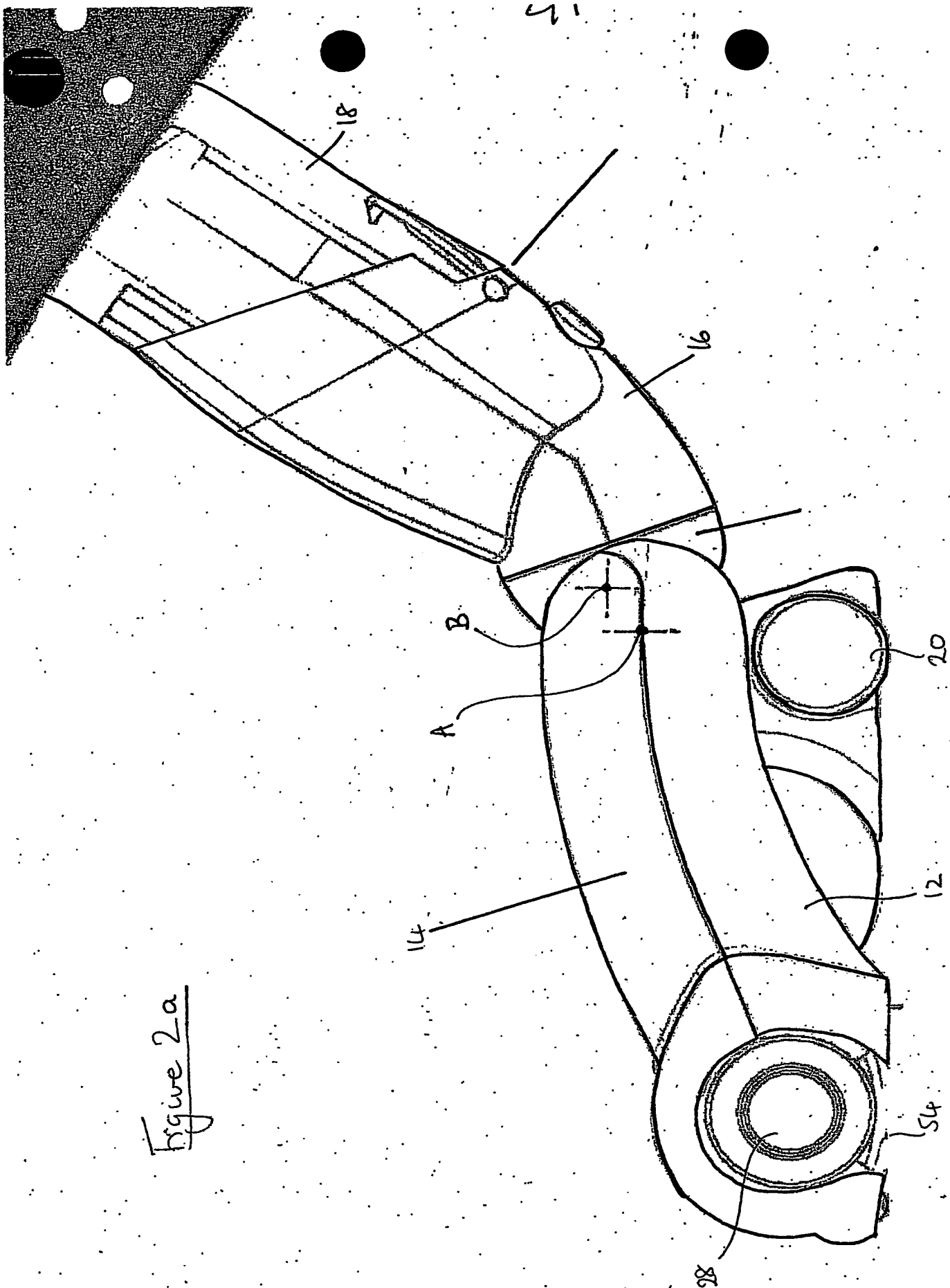


Figure 3

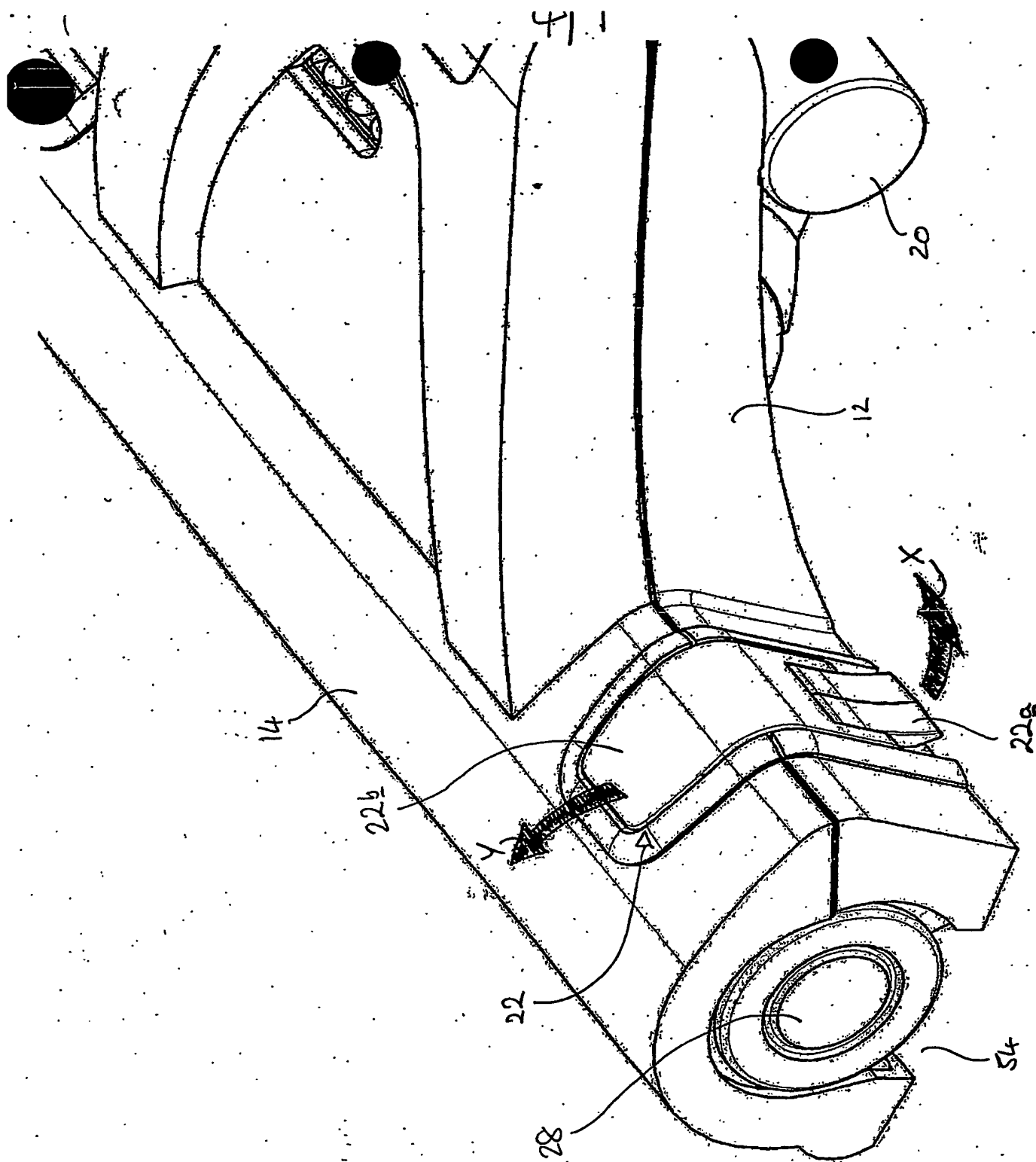
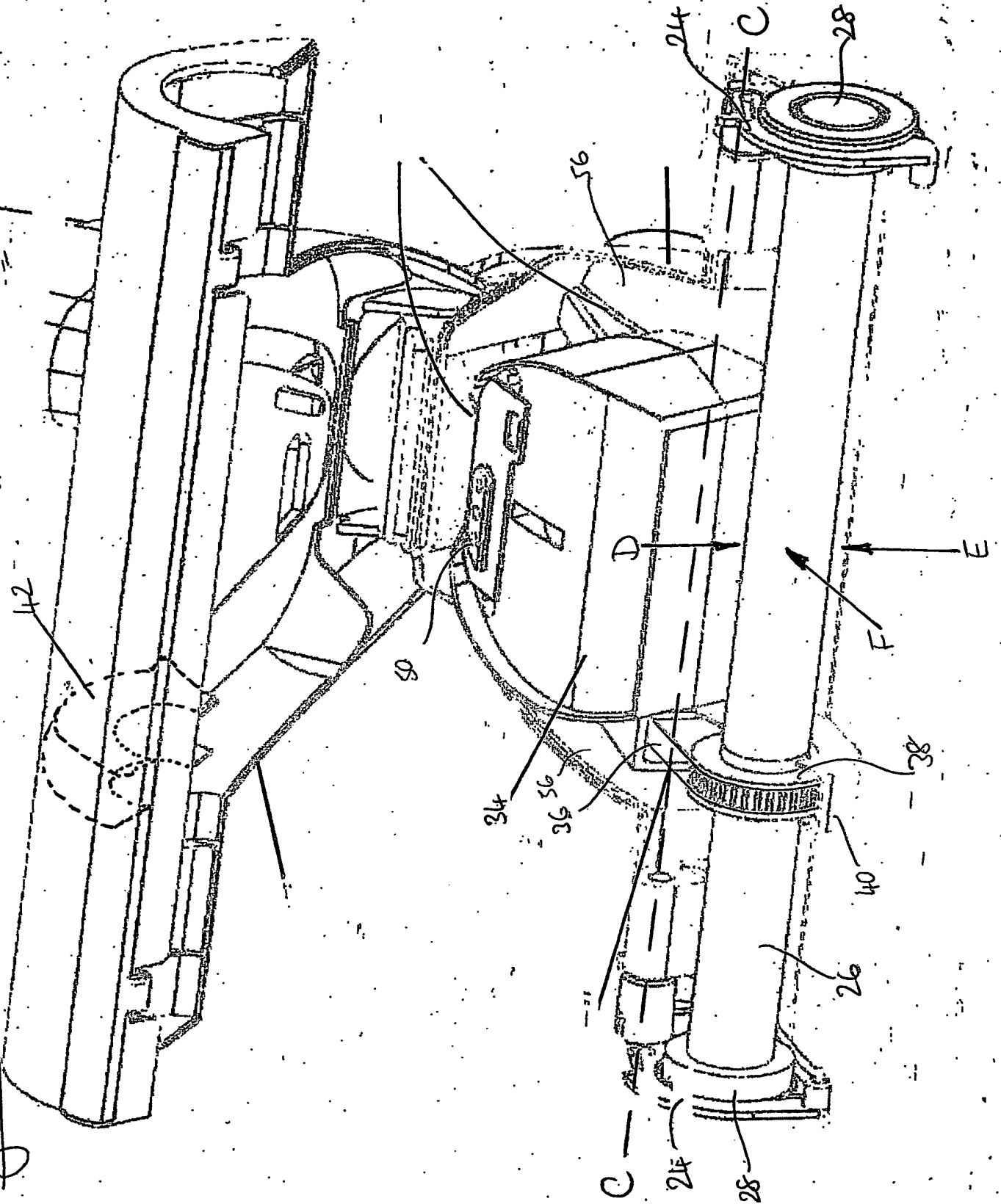


Figure 4



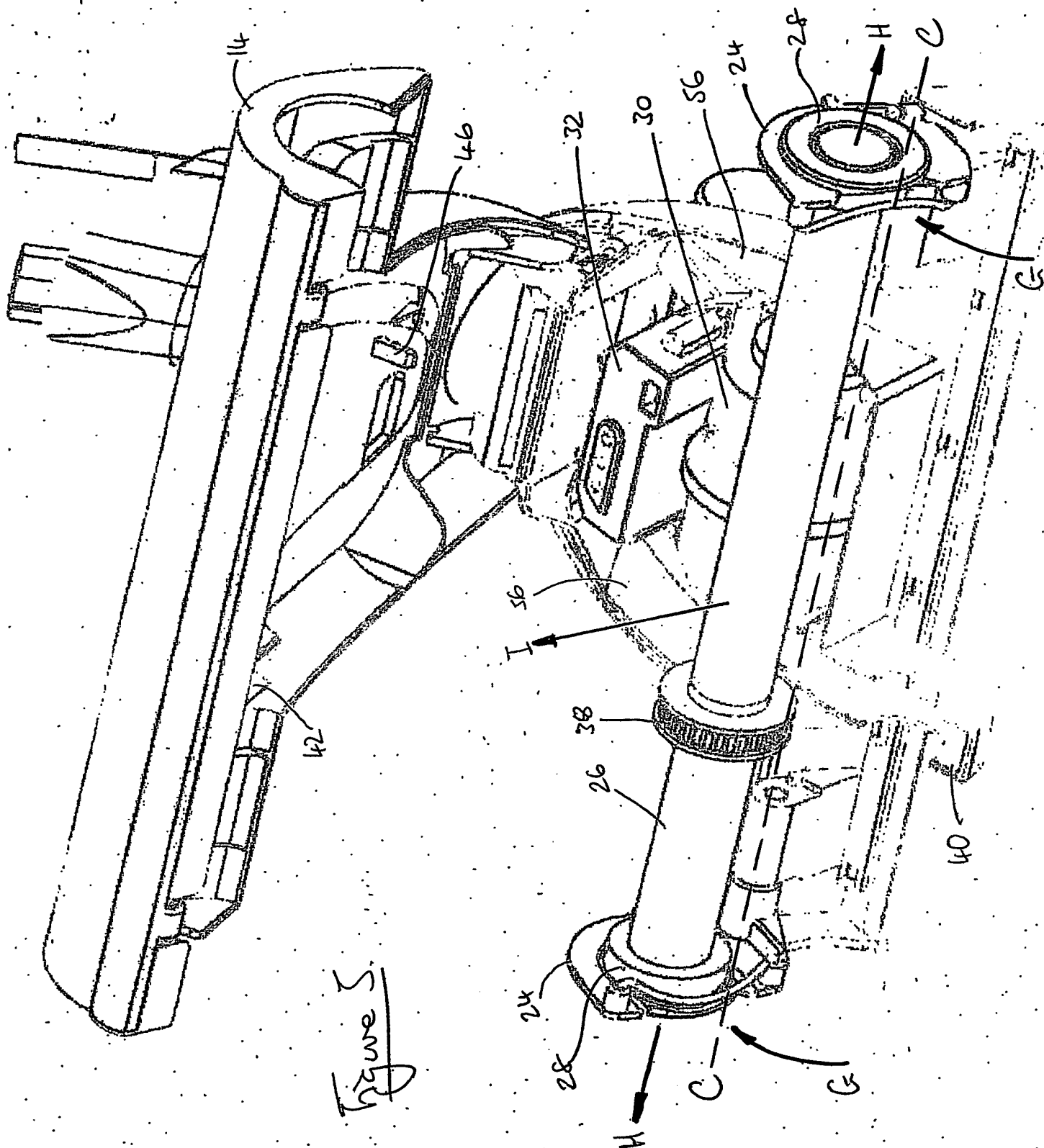


Figure 5.

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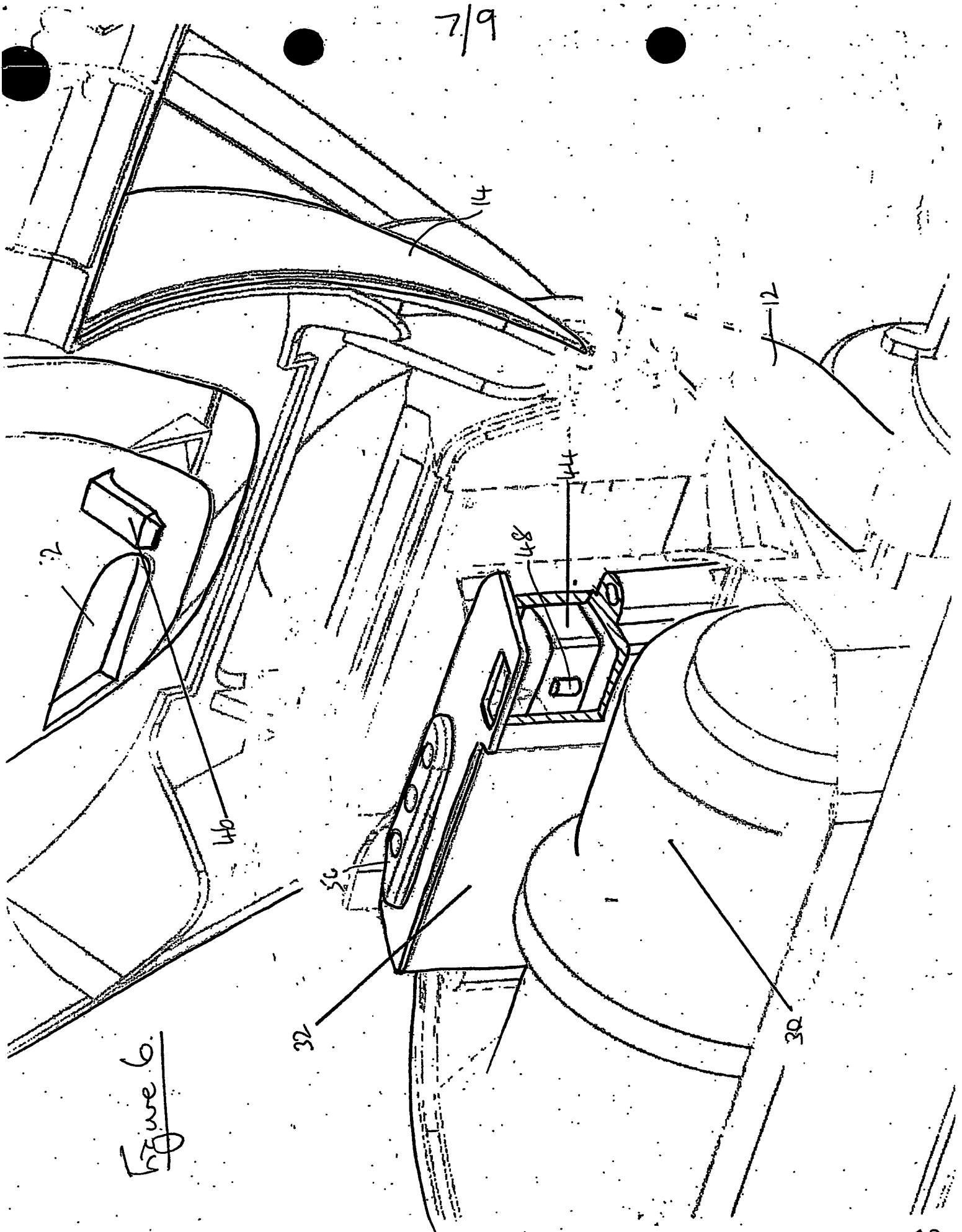


Figure 6.



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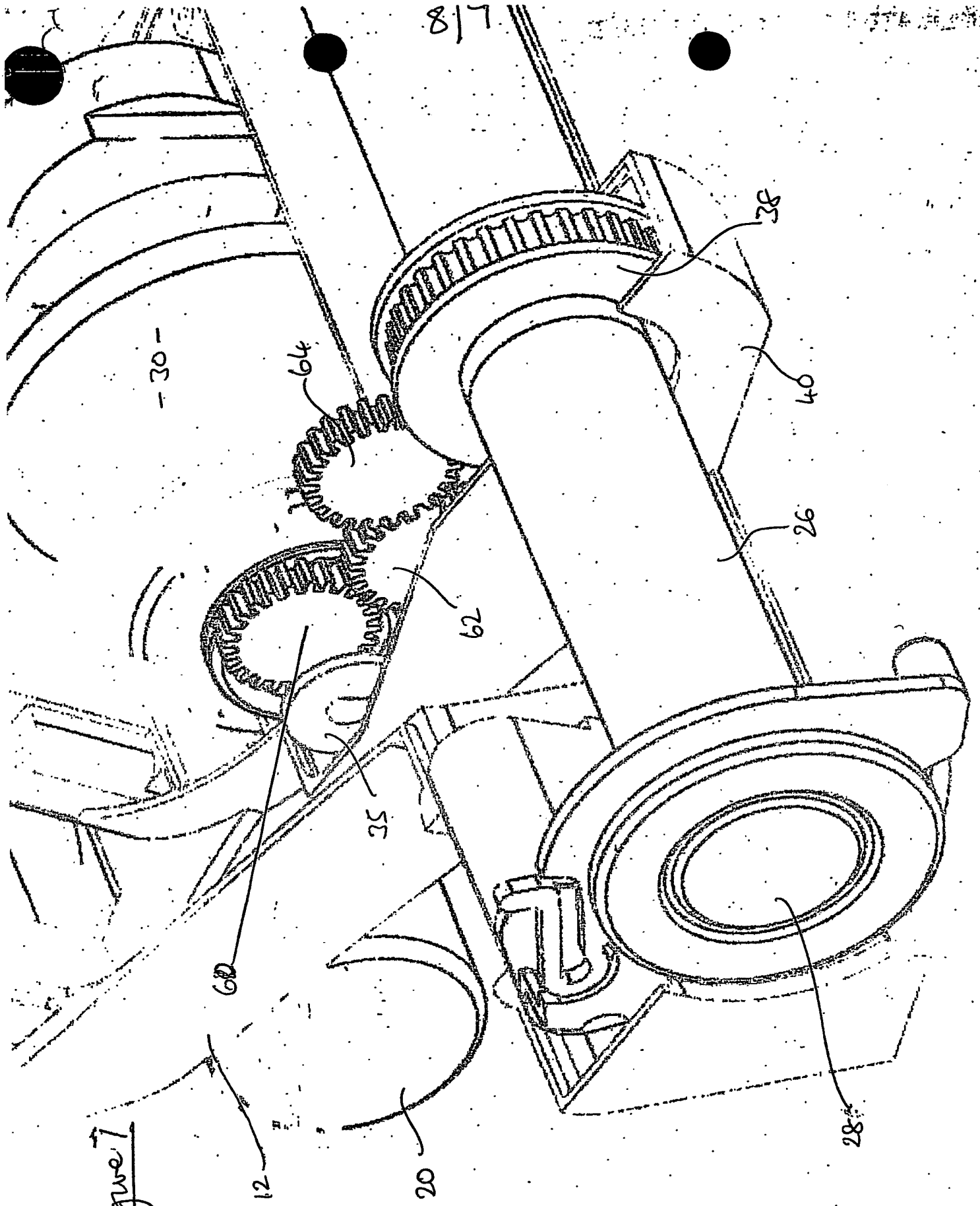


Figure 1

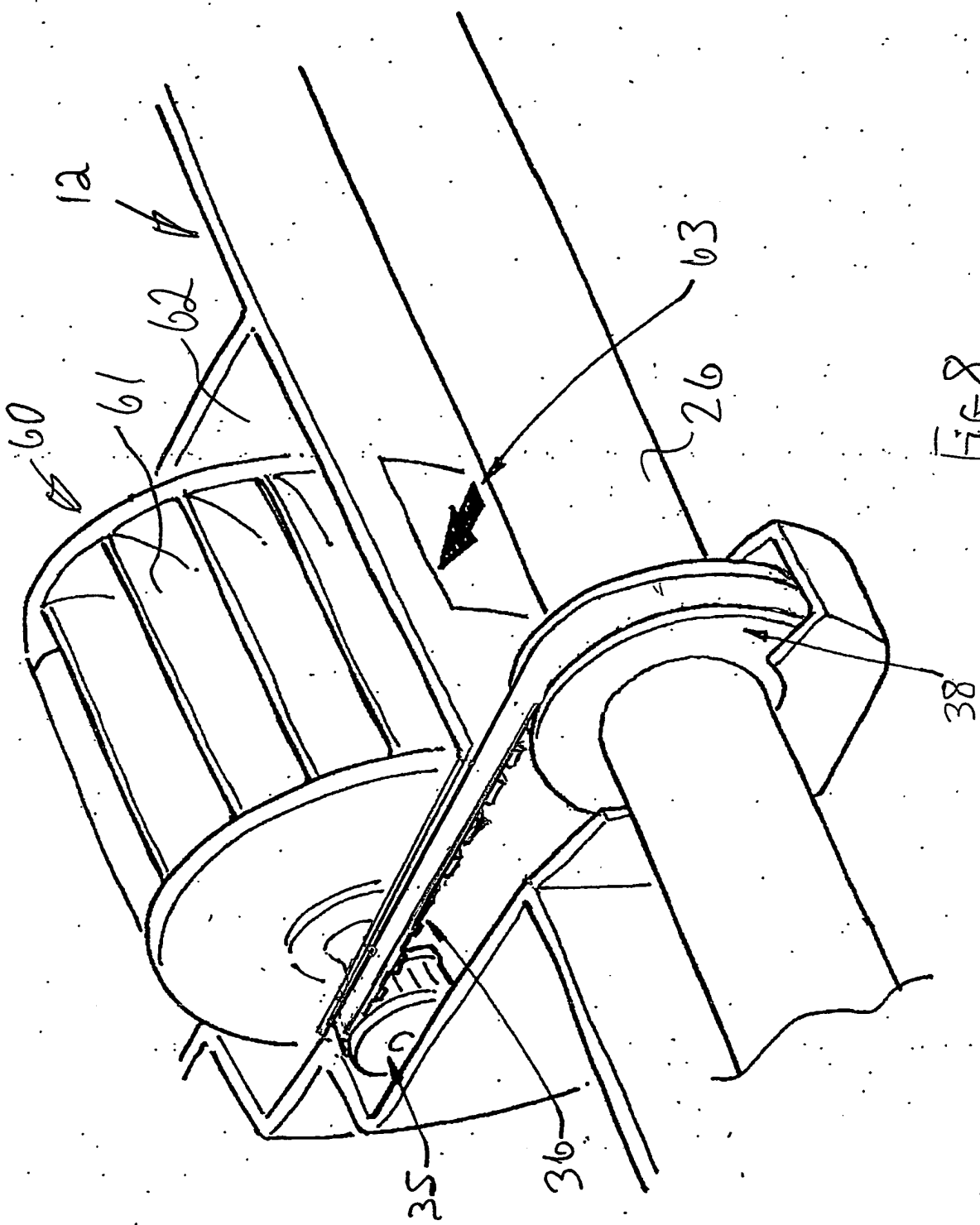
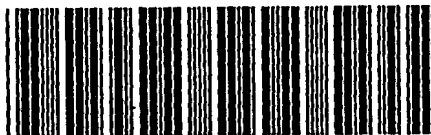


Fig-8

PCT Application

**GB0305301**



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